

- 1) a) Find the area of the region that lies inside the graph of $r = 2 - \sin 2\theta$. Set up the integral and then use your calculator to evaluate the area..
- (b) Find the slope (dy/dx) of the curve $r = 2 - \sin 2\theta$ as a function of θ then evaluate it at $\theta = \frac{\pi}{4}$. Show the work that leads to your answer.
- (c) Find $\frac{dr}{d\theta}$ for curve $r = 2 - \sin 2\theta$ and evaluate it at $\theta = \frac{\pi}{4}$. Then interpret what the value of $\frac{dr}{d\theta}$ means in terms of the movement of the particle. Show the work that leads to your answer.
- d) A particle moves along $r = 2 - \sin 2\theta$ so at time t , seconds $\theta = t^2$, Find the time on the interval $0 \leq t \leq 1$ for which the particle's x-coordinate is 1.
- e) For the particle described in part (d), find the position vector in terms of t .
- f) Using the position found in part (e), find the velocity vector at $t = 2$ seconds.

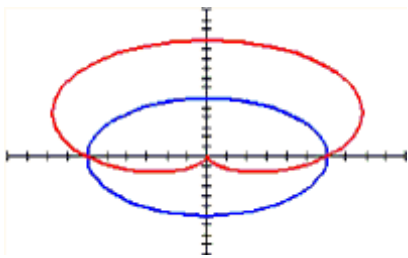
Find the area of the specified region. Set up the intergral and use your calculator to find the area.

2) inside one leaf of the four-leaved rose $r = 3 \sin 2\theta$

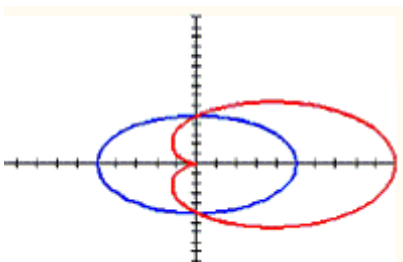
3) inside the smaller loop of the limacon $r = 5 + 10 \cos \theta$

Find the area of the specified region.

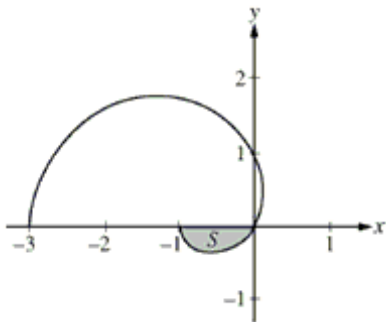
4) shared by the circle $r = 6$ and the cardioid $r = 6(1 + \sin \theta)$



5) Outside the circle $r = 5$ and inside the cardioid $r = 5(1 + \cos \theta)$



- 6) The graph of the polar curve $r = 1 - 2\cos\theta$ for $0 \leq \theta \leq \pi$ is shown. Let S be the shaded region in the third quadrant bounded by the curve and the x-axis.



- a) Write an integral expression for the area of S .
- b) Write expressions for $\frac{dx}{d\theta}$ and $\frac{dy}{d\theta}$ in terms of θ .
- c) Write an equation in terms of x and y for the line tangent to the graph of the polar curve at the point $\theta = \frac{\pi}{2}$. Show the computations that lead to your answer.